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ABSTRACT

The purpose of this study was to validate on a second sample of student teachers, prediction equations developed to predict performance in student teaching. The study was part of a longitudinal project. Equations tested in this study were produced in a previous study by subjecting to multiple regression techniques six biographical and 40 psychological test scores for the 141 subjects who completed their student teaching between the spring of 1974 and the summer of 1975. The prediction equations which were developed for various groups of students in that group were then applied to the data for the 200 students in a second sample to calculate their predicted grades in student teaching. The predicted grades were then compared with the actual grades received by the student teachers. (Author)

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TESTING MODELS DEVELOPED TO PREDICT PERFORMANCE IN STUDENT TEACHING

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ABSTRACT

The purpose of this study was to validate on a second sample of student teachers, prediction equations developed to predict performance in student teaching. The study was part of a longitudinal project, QAULTEP, currently underway at The University of Lethbridge. The equations to be tested in this study were produced in a previous study by this investigator by subjecting to multiple regression techniques six biographical and 40 psychological test scores for the 141 subjects who completed their student teaching between the spring of 1974 and the summer of 1975. The prediction equations which were developed for various groups of students in that group were then applied to the data for the 200 students in a second sample to calculate their predicted grades in student teaching. The predicted grades were then compared with the actual grades received by the student teacher.

Introduction

Schools of education charged with the responsibility for teacher education, like all professional schools, are anxious to select those candidates for their training programs who will become the best professionals in their field. The oversupply of teachers and the consequent prospect of limited enrollments has contributed to a renewed interest in the area of selection and admission to schools of education. With the present trend toward increased emphasis on the field experiences portion of teacher education, performance in student teaching is likely to become, if it is not already, the most important criterion in certification decisions. It follows then that the ability to predict performance in student teaching based on data available to the institution prior to the candidates' admission to the program, would be extremely valuable. Both prospective candidates and the institutions would benefit from the process in that students could receive better vocational advisement and the institutions would be able to invest their time and money in the students who would be more likely to succeed in their program.

Purpose of Study

This study was part of a longitudinal project, QAULTEP[1], currently underway at The University of Lethbridge. Within that project a study[2] was conducted to predict success in student teaching using information collected

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[1] QAULTEP is an acronym for the Qualitative Analysis of the University of Lethbridge Teacher Education Program.

[2] Twa, R.J., & Greene, M.. "Prediction of Success in Student Teaching as a Criterion for Selection in Teacher Education Programs." Alberta Journal of Educational Research, Vol. 26, No. 1, March 1980.

prior to the students' entrance into the teacher education program. That study contains a relatively exhaustive review of the related literature. The purpose of this study was to validate on a second sample of student teachers, the prediction equations developed for the previous sample of students to predict performance in student teaching.

Methodology

The equations to be tested in this study were produced in the previous study by subjecting to multiple regression techniques six biographical and 40 psychological test scores for 141 subjects who had completed their student teaching at The University of Lethbridge between the spring of 1974 and the summer of 1975 (Sample 1). The prediction equations which were developed for various groups of students in that group were then applied to the data for the 200 students who completed their student teaching between the fall of 1975 and the fall of 1978 (Sample 2) to calculate their predicted grades in student teaching. The predicted grades were then compared with the actual grades received in student teaching.

For the total group and the male-female subgroups the following steps were undertaken:

1) The prediction equations developed for Sample 1 were applied to Sample 2 to calculate predicted grades in student teaching.
2) Predicted grades in student teaching for Sample 2 were calculated using each of 1 through n predictors where n was the last variable to enter the prediction equation for Sample 1.
3) A pearson product moment correlation was calculated between the actual grades and the predicted grades created by each equation for each of the groups.
4) The standard deviation of the error between actual student

teaching grade and the grade predicted by each equation was calculated for each of the groups.

5) These standard deviations were plotted to determine which of the Sample 1 predictors were most useful for Sample 2.

Findings

The most obvious general finding was that the equations developed for Sample 1 did not predict with any degree of accuracy the student teaching grades for Sample 2.

Total Group. The equation created by multiple regression on Sample 1 was:

$$\text{Grade} = 1.64481 + (-.00255)\text{FxCP1} + (.16554)Q_1\ 16\text{PF} + (.54311)\text{Major GPA} + (.10243)\text{F16PF} + (.02184)\text{DoCP1} + (-.03121)\text{AlCP1} + (.02964)\text{CmCP1} + (-.11572)\text{O16PF} + (-.92129)\ \text{SyCP1}$$

Employing this equation to create a predicted student teaching grade for Sample 2 resulted in a correlation of .50 between actual grade and predicted grade in student teaching. When the standard deviation of the error between the actual grade and the predicted grades computed for each of 1 through n predictors was plotted, it was found that the most accurate prediction resulted from using only three of the nine best Sample 1 predictors (see Figure 1).

Female Sub-group. Employing the equation created for Sample 1:

$$\text{Grade} = 1.95426 + (.19797)Q_1 16\text{PF} + (.33980)\text{Major GPA} + (.04419)\text{CmCP1} + (-.04455)\text{AiCP1} + (-.01184)\ \text{D Scale} + (.02654)\text{ReCP1}$$

a correlation of -.064 was found to exist between actual grade and predicted grade in student teaching. When the standard deviation of the error between actual and predicted grade was plotted (see Figure 2) It was found that two of the six Sample 1 predictors produced the

Total Group

SD of the error between actual and predicted student teaching grade

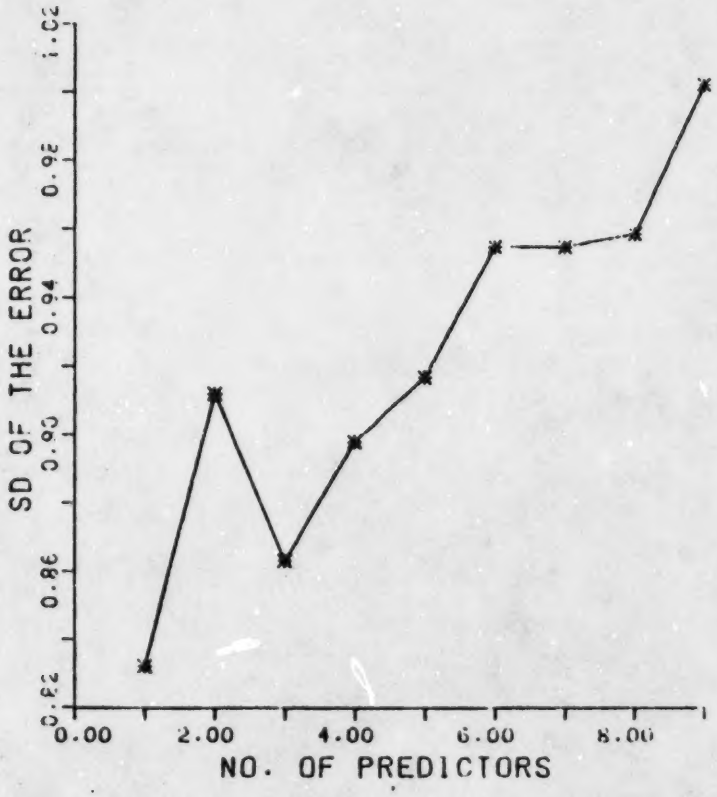

Figure 1

Plot of Error Between Actual and Predicted Grade For 1 Through N Predictors for Total Group

Females

SD of the error between actual and predicted student teaching grade

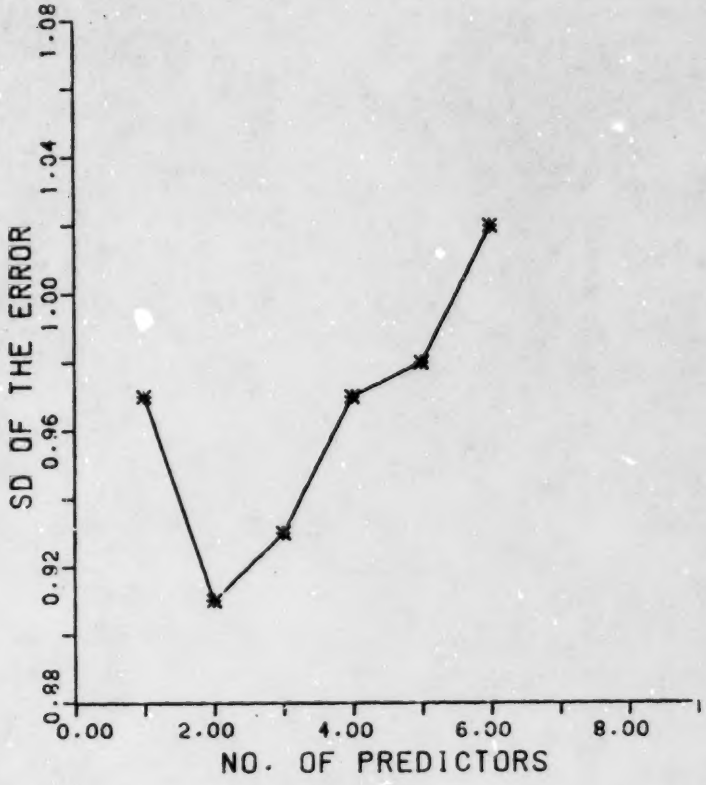

Figure 2

Plot of Error Between Actual and Predicted Grade For 1 Through N Predictors for Females

smallest error in prediction.

Male Sub-group. The equation for Sample was:

Grade = 4.36615 + (.02105)Q-Sort + (-.0419) PyCP1.

The correlation between actual grade and predicted grade in student teaching was .294. When the standard deviation of the error between actual and predicted grade was plotted (see Figure 3) it was found that one of the two Sample 1 predictors produced the most accurate prediction.

Males

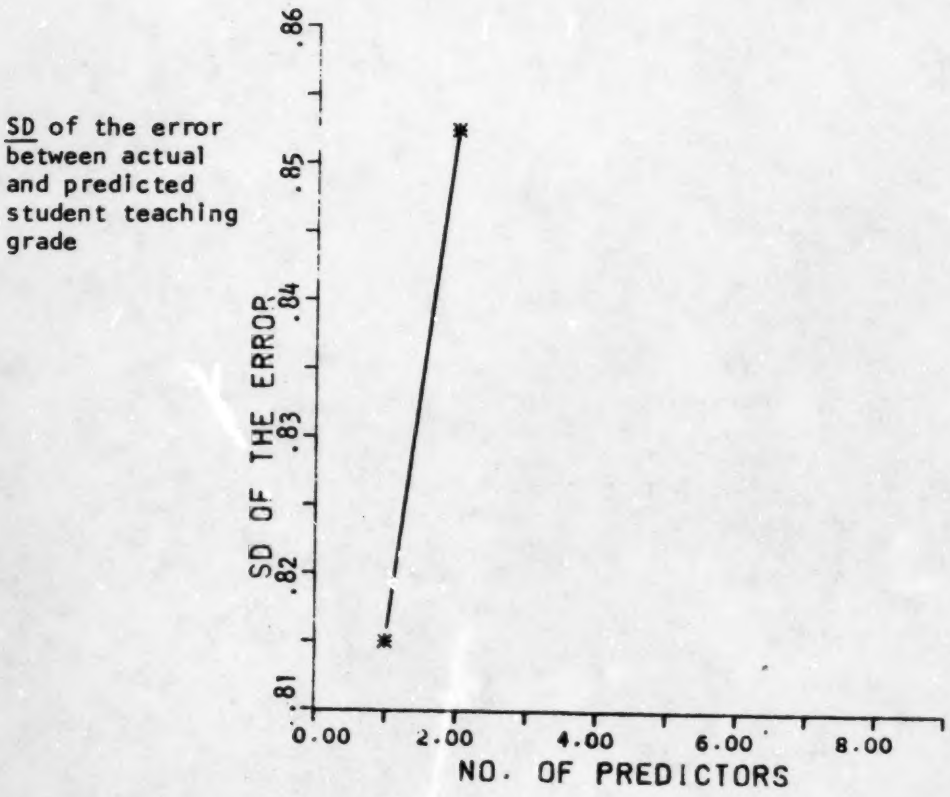

Figure 3

Plot of Error Between Actual and Predicted Grade For 1 Through N Predictors for Males

Additional Analyses

In light of the low correlations between the actual and predicted grades, multiple regression techniques were applied to Sample 2 using the same parameters and the same variables as those used for Sample 1 (with one notable exception in that major GPA, MTAI and TAT scores were not available for Sample 2). The results of that analysis are shown in Table 1.

For the total group the first two variables to enter the regression equation were the same as the second and third variables for Sample 1. The first variable to enter the Sample 1 regression equation (Fx CPI) did not enter the Sample 2 equation at all. For the female subgroup the first two

Table 1

Comparison of Variables Entering Regression Analysis in Sample 1 and Sample 2 for the Total Group

	Sample 1[a]		Sample 2[b]	
Step	Variable	Multiple R	Variable	Multiple R
1	F_xCPI	.275	$Q_1$16PF	.261
2	$Q_1$16PF	.377	Adm GPA	.377
3	Adm GPA	.432	SyCpI	.433
4	F16PF	.477	PyCPI	.488
5	DoCPI	.513	M16PF	.520
6	AiCPI	.542		
7	CmCPI	.566		
8	O16PF	.591		
9	SyCPI	.608		

[a] N = 141

[b] N = 119

variables to enter were the same for Sample 2 as for Sample 1 (see Table 2). For both the total group and the female subgroup Admission GPA and Q_1 16PF (conservative vs experimenting) appeared to be useful predictors. For the male subgroup none of the variables appeared in both equations (see Table 3).

Table 2

Comparison of Variables Entering Regression Analysis in Sample 1 and Sample 2 for Females

	Sample 1[a]		Sample 2[b]	
Step	Variable	Multiple R	Variable	Multiple R
1	Q_1 16PF	.383	Q_1 16PF	.348
2	Adm GPA	.487	Adm GPA	.477
3	CmCPI	.554	Q_2 16PF	.550
4	AlCPI	.596	Conv. Ques.	.588
5	D Scale	.643	PyCPI	.617
6	ReCPI	.669	SoCPI	.642
7			ReCPI	.672
8			SyCPI	.696
9			C_sCPI	.718

[a] N = 74

[b] N = 79

Table 3

Comparison of Variables Entering Regression Analysis in Sample 1 and Sample 2 for Males

	Sample 1[a]		Sample 2[b]	
	Variables	Multiple R	Variables	Multiple R
1	Q Sort	.366	DoCPI	.376
2	PyCPI	.511	Q_2 16PF	.560
3			D Scale	.654
4			Age	.722
5			Q_3 16PF	.764

[a] N = 67 [b] N = 40

Discussion

There are several possible reasons for the fact that so few of the variables that were effective for predicting the grade in Sample 1 were also effective in Sample 2. In the first place because of regression toward the mean, cross-validation procedures are more accurate for the middle of the group; errors are at a maximum at the extremes. Therefore, the 1's (failures and drop-outs) and the 5's (A's) are not likely to be predicted with any degree of accuracy in the 5 point scale employed to categorize student teaching performance.

Secondly, some of the 1's were not failures, but withdrew from the program, and have now returned and are doing well. Also with much of the selection of students now occurring during the "Orientation to Teaching" practicum, and with a second practicum in the professional semester prior to student teaching, actual grades less than a "C" (failures) in student teaching are now very rare.

Finally, and this may be the major reason for the findings, a major assumption underlying validation procedures is that the two samples are similar. This assumption was tested by comparing the criterion and predictor variables for the two groups, using t-tests to test for the significance of the difference between means.

For the total sample the means between the two samples were significantly different ($p < .05$) for the criterion variable, for all of the biographical particulars except admission GPA, for 13 of the 16 subscales on the 16PF, for the English test scores, and for 3 of the 18 subscales on the CPI. Because the results on these variables are usually different for males and females, the tests were rerun for the separate sexes.

For females, "route" and "age" were significantly different between samples, indicating that more females were electing the secondary route, and there were fewer older female students. There were still some differences on some of the 36 psychological test scores (notably, for eight of the 16PF subscales), but these may have occurred by chance. There was no difference in the criterion nor in grade in student teaching.

For males, "route" and "age" were significantly different between populations ($p = 0.000$ and .033) indicating a tendency for males too to elect the secondary route, and for fewer older male students. (This appears reasonable as several years ago there were a large number of older students who were returning to university). Of the 36 psychological test scores, six of the 16PF subscales and three of the CPI subscales were significantly different. Again, these may have occurred by chance. The most notable difference was in the criterion variable. Males in Sample 2 scored significantly higher than those in Sample 1 ($p = .013$).

The grade in student teaching as a criterion presents an interesting dilemma. The significant differences occurred between males and females in Sample 1 ($p = .016$) where females had higher grades and between Sample 1 and Sample 2 ($p = .013$) for males only. This relationship is portrayed diagramatically in Table 4.

Table 4

Results of F-tests Between Means
Student Teaching Grades for Males and Females
in Each Sample

Group	Grade in Student Teaching	
	Sample 1 Mean	Sample 2 Mean
Females	3.88 (N=92)	3.96 (N=118) → not significant
Males	3.52 (N=99) ↓ $p(t \geq .05) = .016$	3.92 (N=61) → $p(t \geq .05) = .013$ ↓ not significant

It appears that the grade in student teaching is increasing for males. It must also be noted that the proportion of males was considerably lower in Sample 2. One might speculate as to the reasons for these changes. It may be that with the introduction of the "Orientation to Teaching" practicum, more males with poorer academic standing are either not being admitted to the Faculty, or are selecting themselves out of the program. Similarly, the academically superior male students may now be more inclined to choose

teaching as a profession. It may be simply that female students previously had some kind of academic advantage by virture of their being female, and with the trend toward "equal rights", this advantage has disappeared. There are also several other possibilities such as overall grade inflation or academically superior females entering other professions.

The effects of these differences between samples is of course to make the validation of Sample 1 equations highly unlikely.

Conclusions and Implications

The most obvious conclusion one can draw from these results is that the particular method of predicting student teaching grades employed in this study is too inaccurate to be of any practical value in selecting candidates for teacher education. However, the fact that a number of the variables did appear in the prediction equations for the respective groups in Sample 1 and Sample 2 provides encouragement for further study of the approach. For example, the method of choosing the array of available predictor variables requires a good deal of further examination as suggested in the original study. Also further analysis should be undertaken to determine the results of combining Sample 1 and Sample 2 and producing new prediction equations to be tested on a subsequent sample.

Another approach which would overcome the difficulty encountered because of significant differences in the criterion variable, between Sample 1 and Sample 2 grade in student teaching, would be to use a measure of "success in teaching" as the criterion variable. One would then of course introduce the problem of defining "success in teaching" and obtaining a suitable measure of it but in view of the importance of this issue it would seem that it would be worth the effort.